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# Oral Health Status of Psychiatric In-patients in Serbia and Implications for Their Dental Care

**Aim** To determine oral health status and identify predictors of oral health in a representative sample of psychiatric in-patients in Serbia.

**Methods** The study included 186 psychiatric in-patients and 186 control participants without psychiatric illness matched to the study group by age, sex, marital status, education level, employment, and monthly income. Dental examinations were done in both groups to measure the following indices of oral health: decayed, missing, and filled teeth (DMFT) index; community periodontal index; and plaque index. Participants were also interviewed about their dental health behavior and their medical records were examined.

**Results** Psychiatric in-patients had higher caries prevalence, poorer periodontal health, and poorer oral hygiene than controls. The average DMFT score in the patient group was 24.4 and 16.1 in the control group ( $P < 0.001$ ). Periodontal diseases were significantly more prevalent among psychiatric in-patients than among controls ( $P < 0.001$ ). The average plaque index for patients was 2.78 and 1.40 for controls ( $P < 0.001$ ). Multiple regression analysis demonstrated that 1) DMFT index was associated with age, male sex, duration of mental illness, use of antidepressants, time since the last visit to the dentist, and snacking frequency; 2) community periodontal index was associated with male sex; and 3) plaque index was associated with age, male sex, education level, employment, monthly income, tooth brushing technique, and snacking frequency.

**Conclusion** Psychiatric in-patients in Serbia have poorer oral health than healthy controls. It is necessary to intensify preventive dental care in this vulnerable population.

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Mental disorders are an important problem for every national health care service. These disorders are complex to treat since they often show high rates of recurrence and comorbidity, and they can exact high long-term costs on the individual, family, and society. People with psychiatric disorders often have advanced oral diseases since psychiatric disorders lead them to change their behavior, neglect social contacts, lose concern for general and oral health, and form bad habits in oral hygiene or give up oral hygiene altogether. Also, antipsychotic therapies may have adverse effects on oral health as medications are taken over a long period of time, which increases the risk for oral diseases and their duration (1-3). Poor oral health has long been documented among institutionalized individuals (4,5). Research worldwide has shown that this vulnerable population has more extracted or carious teeth, fewer filled teeth, more advanced periodontal disease, poorer oral hygiene, and more frequent xerostomia than general population (4-7).

Serbia is one of the few countries in the world that does not have current data on the oral health status of the general population. Disastrous events in the country and the region (war, immigration, terrorism, hyperinflation) have caused a 13.5% increase in the prevalence of mental and behavioral disorders in Serbia in the last few years, making them the second largest public health problem. Also, the health system itself has deteriorated due to prolonged difficulties (8). Recent transformation of health care systems in most Balkan countries, especially in those undergoing political and economical transition, has almost completely excluded dentistry from the primary health care system, leading it to develop into a very expensive industry based on private practices. To avoid total exclusion of primary oral health care from the National Health Care System, at the beginning of 2009 Serbia introduced the National Program for Prevention of Oral Diseases (9). The program was supported by the National Health Insurance scheme using funding allocated to primary health care and targeted at-risk groups: pregnant women, handicapped, and children up to 18 years of age. Unfortunately, psychiatric patients were not included.

In addition to the lack of data on the oral health of the general population in Serbia, there are no recent data on the oral health status of psychiatric patients in the country. Since approximately 479 803 (6.5%) of the total population is affected by psychiatric disorders with the codes F20-F39 (based on the International Classification of Diseases of the World Health Organi-

zation, ICD-10) (10), they are likely to require a specially designed preventive program.

The aim of the study was to determine the oral health status of psychiatric in-patients in Serbia and to identify important predictors of oral health status by analyzing a number of demographic, socioeconomic, and psychiatric factors, as well as data on patients' dental health behavior.

## PARTICIPANTS AND METHODS

This study was conducted in the Dr Laza Lazarević Special Psychiatric Hospital and the Health Centre Zemun, both in Belgrade, Serbia, during 2007. This Psychiatric Hospital and Health Centre were chosen because they are typical psychiatric and health treatment centers in Serbia according to the number, diagnoses, and other socioeconomic and demographic characteristics of patients. The approval for the study was obtained from the ethics committee of the Dental School, University of Belgrade and the ethics committee of the Special Psychiatric Hospital.

All 240 psychiatric patients hospitalized between March and June 2007 were eligible for participation. These patients had a median age of 48 years (range of 20-59). Patients with serious somatic illness, severe disability, dementia, intellectual disability, and aggressive and uncooperative patients were excluded from the study due to their limited ability to cooperate. Out of the total study group of 240 eligible patients, 42 (17%) were too ill, uncooperative, or aggressive, and 12 (5%) refused to participate. Thus, the final study group included 186 (78%) participants. All patients gave their written informed consent.

The patients in the study group had the following diagnoses, based on the ICD-10 (10): 106 (57%) had schizophrenia (F20); 45 (24%) had unspecified unorganic psychotic disorder (F29); 24 (13%) had schizoaffective disorders (F25); 3 (1.6%) had recurrent depressive disorder and actual severe episode with psychotic symptoms (F33.3); 4 (2.2%) had major depressive disorder with psychotic features (F32.3); 2 (1.1%) had persistent psychotic disorder (F22); and 2 (1.1%) had bipolar affective disorder (F31).

Control participants were 186 persons without mental illness who were included in the study in the order they appeared at the dental department of the Regional Health Center in Zemun, Belgrade, for dental consultations or interventions. They were matched to the study group by

age, sex, marital status, education level, employment, and monthly income. Control participants did not use any medications that could affect oral health.

The data in the study were obtained by dental examination according to World Health Organization criteria (11). The decayed, missing, and filled teeth (DMFT) index was used to record caries prevalence (11). The periodontal status was assessed using the community periodontal index (CPI) probe (11). Oral hygiene was assessed using the Sillness-Löe plaque index (PI) (12). Examinations were conducted by the first author (S.J.), and a trained assistant recorded the data. All dental examinations were performed in the dental office in the Psychiatric Hospital, equipped with a dental chair with adequate light and standard dental instruments.

After the dental examination, each participant was assessed using a structured interview that lasted 15-30 minutes. The interview included questions about demograph-

ics and socioeconomic status and open-ended questions related to dental health behavior.

Data about psychiatric disease in the study group were taken from hospital records. They included the following: psychiatric diagnosis, duration of mental illness, number of hospitalizations, duration of current hospitalization, and the type and number of psychiatric drugs.

### Statistical analysis

Results are reported as mean  $\pm$  standard deviation. For comparison analyses, we used *t*-test for parametric data, and  $\chi^2$  and Fisher exact test for non-parametric data. Multiple regression analysis was used to identify predictors of DMFT index, CPI, and PI. These indices were entered as dependent variables. Independent variables were demographic and socioeconomic variables (age, sex, marital status, education level, employment, and monthly income), data about psychiatric disease (psychiatric diagnosis, dura-

**TABLE 1.** Sociodemographic characteristics of psychiatric in-patients in Serbia and control group

Characteristics	Study group (n = 186)	Control group (n = 186)	P
<b>Sex, n (%):</b>			
male	87 (47)	86 (46)	1.000*
female	99 (53)	100 (54)	
<b>Age (years), median (range)</b>	46 (20-59)	51 (19-58)	0.510 (t = -0.66)
<b>Marital status, n (%):</b>			
single	82 (44)	24 (13)	<0.001 ( $\chi^2 = 63.78$ )
married/partner	52 (28)	127 (68)	
divorced	37 (20)	26 (14)	
widowed	15 (8)	9 (5)	
<b>Education level, n (%):</b>			
primary school	58 (31)	15 (8)	<0.001 ( $\chi^2 = 42.30$ )
secondary school	113 (61)	128 (69)	
university	15 (8)	43 (23)	
<b>Work status, n (%):</b>			
employed	9 (5)	175 (94)	<0.001 ( $\chi^2 = 299.89$ )
retired	177 (95)	11 (6)	
<b>Net monthly income (€), mean <math>\pm</math> standard deviation)</b>	105.82 $\pm$ 72.07)	341.67 $\pm$ 126.03)	<0.001 (t = -22.15)
<b>Current smokers, n (%)</b>	178 (95)	93 (50)	<0.001*
<b>Duration of mental illness (years), median (range)</b>	8 (1-21)		
<b>Number of hospitalizations, median (range)</b>	6 (1-15)		
<b>Duration of current hospitalization (days), median (range)</b>	25 (7-86)		
<b>Treatment with psychiatric drugs, n (%):</b>			
anxiolytics	180 (97)		
antipsychotics	179 (96)		
antidepressants	39 (21)		
<b>Number of psychiatric drugs, median (range)</b>	4 (2-6)		

\*Fisher exact test.

tion of mental illness, number of hospitalizations, duration of current hospitalization, and type and number of psychiatric drugs), and dental health behavior (time since the last visit to the dentist, frequency of renewing the toothbrush, technique of tooth brushing, duration and frequency of tooth brushing, snacking frequency, and knowledge of adverse effects of oral diseases on general health). Statistical significance level was set at  $P < 0.05$ . Statistical calculations were performed with SPSS, version 14.0 for Windows (SPSS Inc., Chicago, IL, USA).

## RESULTS

Demographic and socioeconomic data for the study and control group (both  $n = 186$ ) are presented in Table 1, together with psychiatric data for the study group. Mean DMFT index in the study group was  $24.4 \pm 5.1$  and  $16.1 \pm 1.0$  in the control group ( $t = 9.357$ ,  $P < 0.001$ ). DMFT index in the study group was  $3.4 \pm 2.4$  for decayed teeth,  $19.0 \pm 8.2$  for missing teeth, and  $2.0 \pm 2.1$  for filled teeth, and in the control group  $1.6 \pm 1.0$  for decayed teeth,  $9.9 \pm 1.0$  for missing teeth, and  $4.6 \pm 2.4$  for filled teeth. All of these values

differed significantly between the groups ( $t = 13.5$ ,  $-11.338$ , and  $19.026$ , respectively;  $P < 0.001$  in all cases).

There were 37 (19.9%) edentulous patients in the study group, while in the control group there were no edentulous patients. Only 9 (24.7%) edentulous patients had dentures.

Among the 149 dentate patients, bleeding from the gingiva was found in 5 (3.3%), calculus in 22 (15%), shallow pockets in 30 (20%), and deep pockets in 42 (28.3%). Among controls, only 15 (8.3%) were free of any signs of periodontal disease, while incidences of gingival bleeding and calculus were found in 28 (15%) and 31 (16.6%) participants. Thirty three (18%) had shallow pockets and 47 (25%) deep pockets. The study group had a higher percentage of excluded sextants (33%) than the control group (17%). All of these periodontal diseases were significantly more prevalent among psychiatric patients than among controls ( $\chi^2 = 114.65$ ,  $P < 0.001$ ).

The study group had a higher mean PI ( $2.78 \pm 0.32$ ) than control group ( $1.40 \pm 0.39$ ) ( $t = -35.54$ ,  $P < 0.001$ ).

**TABLE 2.** Responses of psychiatric in-patients in Serbia and control group to the oral health behavior questionnaire

Question	Study group, n (%)	Control group, n (%)	P
<b>1. When did you last visit a dentist?</b>			
More than a year ago	159 (85.5)	10 (5.4)	<0.001*
Less than a year ago	27 (14.5)	176 (94.6)	
<b>2. How often do you renew your toothbrush?</b>			
Less often than every 3 mo	183 (98.2)	40 (21.6)	<0.001*
Every 3 mo	3 (1.8)	146 (78.4)	
<b>3. Do you use correct tooth brushing technique? †</b>			
Incorrect	159 (85.5)	62 (33.3)	<0.001*
Correct	27 (14.5)	124 (66.7)	
<b>4. How often do you brush your teeth?</b>			
Every other day/rarely	41 (24.0)	1 (0.5)	<0.001 ( $\chi^2 = 157.316$ )
Once a day	99 (57.9)	30 (16.1)	
Several times during the day	31 (18.1)	155 (83.4)	
<b>5. How long do you brush your teeth?</b>			
Less than 1 min	132 (77.2)	14 (7.5)	<0.001 ( $\chi^2 = 176.94$ )
More than 1 min	39 (22.8)	172 (92.5)	
<b>6. How frequently do you snack?</b>			
More than once per day	128 (68.8)	4 (2.2)	<0.001*
Occasionally	58 (31.2)	182 (97.8)	
<b>7. Do you agree with the statement, "Oral and dental diseases have an impact on general health"?</b>			
I disagree	59 (31.7)	1 (0.5)	<0.001*
I agree	127 (68.3)	185 (99.5)	

\*Fisher exact test.

†In addition to responding to the question, each patient demonstrated his or her toothbrushing technique in front of the dentist, who then made a final determination of whether the technique was correct or not.

**TABLE 3.** Results of multiple regressions to identify demographic and socioeconomic predictors of decayed, missing, and filled teeth index, community periodontal index, and plaque index based on data from psychiatric in-patients

	Decayed, missing, and filled teeth index (n = 186)				Community periodontal index (n = 149)				Plaque index (n = 149)			
	unstandardized coefficients				unstandardized coefficients				unstandardized coefficients			
	B	standard error	t	P	B	standard error	t	P	B	standard error	t	P
Sex	-1.991	0.558	-3.568	<0.001	-0.185	0.066	-2.815	0.006	-0.270	0.046	-5.854	<0.001
Age (years)	0.410	0.040	10.287	<0.001	0.002	0.005	0.357	0.722	0.014	0.004	3.856	<0.001
Marital status	0.269	0.611	0.440	0.661	-0.057	0.073	-0.776	0.439	-0.053	0.051	-1.035	0.302
Education level	-0.574	0.432	-1.328	0.186	-0.051	0.056	-0.911	0.364	-0.089	0.040	-2.242	0.027
Work status	0.582	1.358	0.429	0.669	-0.032	0.148	-0.215	0.830	0.217	0.104	2.096	0.038
Monthly income	0.090	0.078	1.148	0.252	-0.014	0.010	-1.477	0.142	-0.021	0.007	-3.126	0.002

**TABLE 4.** Results of multiple regressions to identify psychiatric predictors of decayed, missing, and filled teeth index, community periodontal index, and plaque index based on data from psychiatric in-patients

	Decayed, missing, and filled teeth index (n = 186)				Community periodontal index (n = 149)				Plaque index (n = 149)			
	unstandardized coefficients				unstandardized coefficients				unstandardized coefficients			
	B	standard error	t	P	B	standard error	t	P	B	standard error	t	P
Psychiatric diagnosis	-1.457	0.893	-1.631	0.105	0.080	0.077	1.039	0.301	-0.107	0.061	-1.764	0.080
Duration of mental illness	0.014	0.007	2.003	0.047	<0.001	0.001	-1.105	0.271	<0.001	<0.001	-0.235	0.815
Number of hospitalizations	0.019	0.135	0.143	0.886	0.030	0.011	2.647	0.009	0.014	0.009	1.604	0.111
Duration of current hospitalization	0.017	0.028	0.586	0.558	<0.001	0.003	-0.164	0.870	<0.001	0.002	-0.163	0.871
Number of psychiatric drugs	0.391	0.545	0.718	0.474	0.029	0.046	0.639	0.524	0.035	0.036	0.982	0.328
Anxiolytics	-0.584	2.021	-0.289	0.773	0.242	0.175	1.387	0.168	0.147	0.137	1.068	0.287
Antipsychotics	2.545	2.163	1.176	0.241	0.148	0.174	0.847	0.398	0.152	0.137	1.108	0.270
Antidepressants	2.493	0.958	2.603	0.010	-0.046	0.087	-0.529	0.597	0.018	0.069	0.267	0.790

The results of the structured interview are presented in Table 2. A significantly lower percentage of the study group had visited a dentist in the past year, they brushed their teeth significantly shorter and less often, significantly more used incorrect brushing technique, and in a significantly lower proportion agreed that oral diseases had an adverse effect on general health.

Multiple regression analysis identified significant demographic and socioeconomic predictors of DMFT index score ( $F [6,179]=28.713, P<0.001, R^2=0.473$ ), CPI score ( $F [6,142]=2.218, P=0.045, R^2=0.047$ ), and PI score ( $F [6, 142]=10.107, P<0.001, R^2=0.270$ ). Significant predictors for DMFT index score in patients were older age and male sex; for CPI score male sex; and for PI score male sex, older age, lower education level, unemployment, and lower monthly income (Table 3).

Another multiple regression analysis identified psychiatric predictors. Significant predictors were found for DMFT index score ( $F[8,177]=2.551, P=0.012, R^2=0.063$ ) and PI score ( $F[8,140]=2.309, P=0.023, R^2=0.066$ ), but not for CPI score ( $F[8,140]=1.567, P=0.140, R^2=0.030$ ). Significant predictors for DMFT index score were longer duration of mental illness and the use of antidepressants (Table 4).

Also, a multiple regression analysis was conducted to identify dental health behaviors as predictors, in which significant results were obtained for DMFT index score ( $F[7,163]=4.465, P<0.001, R^2=0.125$ ) and PI score ( $F[7,137]=15.805, P<0.001, R^2=0.419$ ), but not for CPI score ( $F[7,137]=1.807, P=0.091, R^2=0.038$ ). Significant predictors for DMFT index score in patients were time since the last visit to the dentist and snacking fre-

**TABLE 5.** Results of multiple regressions to identify dental health behaviors that predict decayed, missing, and filled teeth index, community periodontal index, and plaque index based on data from psychiatric in-patients

	Decayed, missing, and filled teeth index (n = 186)				Community periodontal index (n = 149)				Plaque index (n = 149)			
	unstandardized coefficients				unstandardized coefficients				unstandardized coefficients			
	B	standard error	t	P	B	standard error	t	P	B	standard error	t	P
Time since last visit to the dentist	-2.299	1.029	-2.234	0.027	0.118	0.092	1.283	0.202	0.085	0.057	1.486	0.139
Renewal of toothbrush	-0.402	2.854	-0.141	0.888	-0.202	0.249	-0.812	0.418	-0.295	0.155	-1.911	0.058
Technique of tooth brushing	0.039	1.135	0.034	0.973	-0.031	0.118	-0.263	0.793	-0.313	0.073	-4.275	<0.001
Tooth brushing frequency	0.707	0.631	1.120	0.265	-0.015	0.061	-0.255	0.799	-0.043	0.038	-1.144	0.255
Tooth brushing duration	-1.238	0.690	-1.794	0.075	0.071	0.066	1.080	0.282	-0.035	0.041	-0.857	0.393
Snacking frequency	-3.460	0.881	-3.929	<0.001	-0.216	0.084	-2.567	0.011	-0.230	0.052	-4.418	<0.001
Knowledge of adverse effect of oral diseases on general health	0.549	0.573	0.958	0.340	0.003	0.052	0.060	0.953	-0.017	0.032	-0.541	0.589

quency; predictors for PI score were incorrect tooth brushing technique and snacking frequency (Table 5).

## DISCUSSION

Psychiatric in-patients in Serbia had higher caries prevalence and worse periodontal health and oral hygiene than matched controls. Mean DMFT index score in our patients was 24.4, while in the study by Kumar et al (13) it was 0.92, and they attributed it exclusively to water fluoridation in the area surrounding the hospital. In contrast, Ramon et al (5), Velasco et al (14), and Angelillo et al (4) reported DMFT index scores closer to ours (26.74, 24.99, and 15.5, respectively). The average age of patients in these 3 studies was higher than in the study by Kumar et al. The average age of patients in our study was 46 years, while in previous studies it varied from 54 to 71 years (4,5,14-16).

Our sample of psychiatric patients included 20% of edentulous patients, which is higher than the 11.1% reported by Angelillo et al (4) and 6.6% reported by Tang et al (17). In our sample, there was also a higher mean number of missing and decayed teeth and fewer filled teeth than in these studies. Mean number of filled and decayed teeth in the previous studies was far lower than mean number of missing teeth (4,5,14,18). These differences likely reflect the differences in the characteristics of the patient groups; eg, Vigild et al studied individuals older than 65 years (18).

As a result of their psychiatric disease and dental care habits, our patients had higher DMFT index scores than age-matched controls. Multiple regression analysis showed that mean DMFT index score in the study group increased with age, which supports the results of similar studies (4,14,16). It was as higher in men, while Velasco et al (14) showed that it was higher in women. It also increased with the duration of mental illness and with the use of antidepressants. Hede et al (16) also found that DMFT index score was associated with duration of mental illness. This is probably because salivary inhibition caused by antidepressants has been identified as a cause of caries (19). We further found that the DMFT index was higher in patients with higher snacking frequency and in patients who had not visited a dentist in the past year. This finding is not surprising, yet it has not been investigated so far.

In our study, psychiatric patients had a high prevalence of periodontal disease; in fact, all the patients had some form of periodontal disease. These findings are in accordance with other studies (4,20). The frequency and severity of periodontal disease was greater in our patients than in controls. Multiple regression analysis showed male sex to be associated with worse periodontal status. In contrast, Velasco reported female sex as a predictor of poor periodontal condition in psychiatric patients (20). However the study by Velasco had different sex distribution than ours – 61% and 47% male participants, respectively. Better periodontal conditions in our female sample possibly confirm

our anecdotal experience that Serbian women take better care of general and dental health. We did not find that factors of psychiatric disease and dental health behavior predicted CPI values. This could be explained by the fact that all of the patients already had very high CPI scores and hence there was almost no variation in this value. Therefore, further research is needed to assess whether these factors have an influence on CPI values.

Oral hygiene assessment revealed that patients had significantly worse oral hygiene than controls. The average PI was 1.38 points higher in patients than in controls, a significant difference suggesting a very low level of oral hygiene. This difference in PI is in agreement with the results of similar studies (6,15,16) and is expected given the changes in daily habits caused by psychiatric illness. As has been described by Hede (16), negative symptoms in schizophrenia and personality disorders may be responsible for poor tooth brushing habits (16). Multiple regression analysis showed that oral hygiene status in patients deteriorated with age, which is in accordance with other studies (13,15,21). PI score was also higher in patients who were male, less educated, unemployed, or with lower monthly income. Lower education suggests a lack of information on general and oral health, while lower monthly income provides fewer opportunities for maintaining oral health care and prevention. Our results support the findings demonstrating that individuals with psychiatric disabilities are often deprived of dental care due to financial problems or lack of dental insurance (22). We found that factors of psychiatric disease taken together significantly predicted the PI values, but none of them alone was a significant predictor. This may reflect the different time scale over which psychiatric factors and PI vary: the former vary within months and years, while the latter varies within weeks. Therefore, it was not probable to statistically verify the influence of each particular psychiatric factor on PI, although the effect of the factors together was significant.

The results of this study should be interpreted with caution because of several limitations. First, there were many more participants (95%) with psychotic disorder than with affective disorders (5%). Second, there were differences between study and control groups in some demographic and socioeconomic variables: marital status, education level, employment, and monthly income. Third, significantly more psychiatric patients than controls reported smoking. Smoking is known to have adverse effects in the oral cavity (23,24), but we did not control for it. Fourth, the dental health behavior questionnaire used for our structured in-

terviews was not standardized although it is known that results obtained using validated questionnaires are more relevant and reliable than those obtained using unvalidated instruments (25). Despite these limitations, we believe that results of this study allow us to make reliable conclusions about the current status of oral health in psychiatric in-patients.

In summary, dental status of psychiatric in-patients was worse than that of controls. We found several predictors of poor oral health among patients, which may be useful for designing social and dental interventions to improve oral health of this vulnerable population.

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